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UNITED STATES DEPARTMENT OF AGRICULTURE
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EXHIBIT

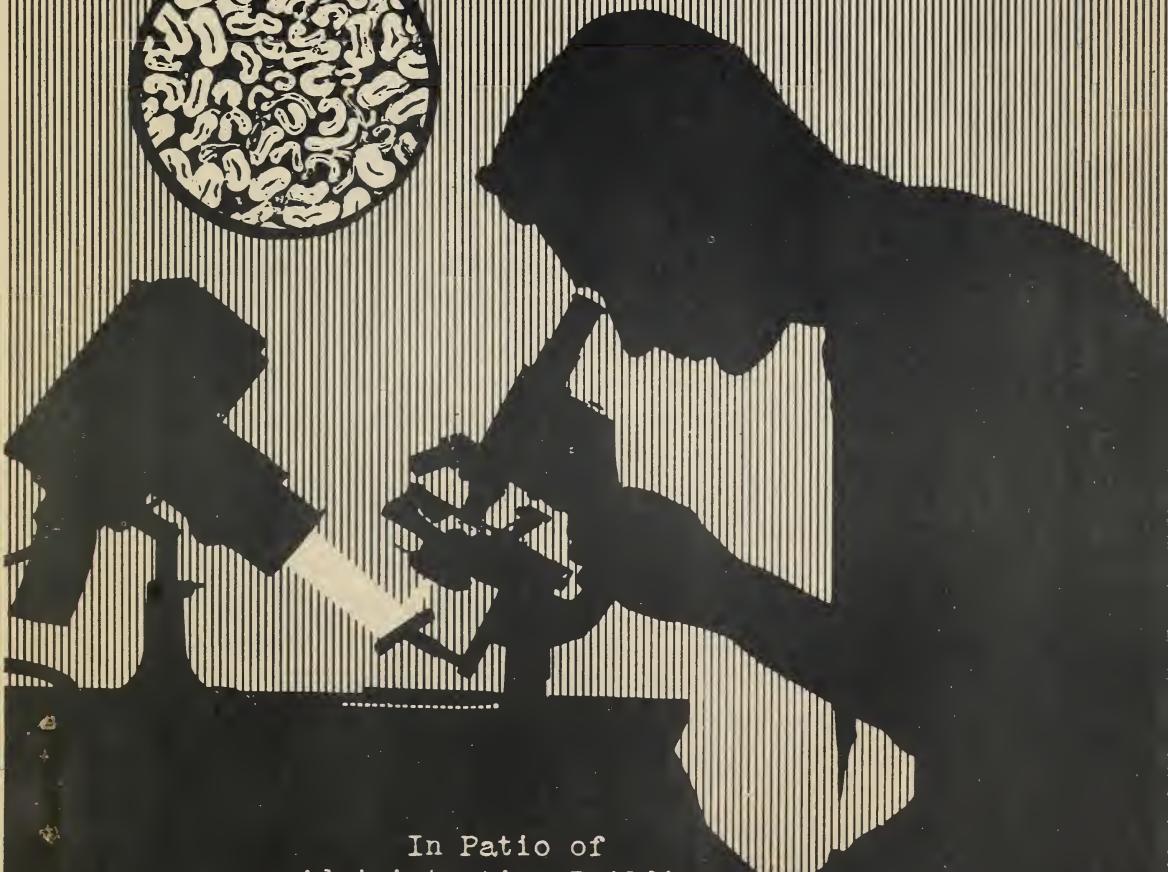
FOR THE

EIGHTH AMERICAN SCIENTIFIC CONGRESS

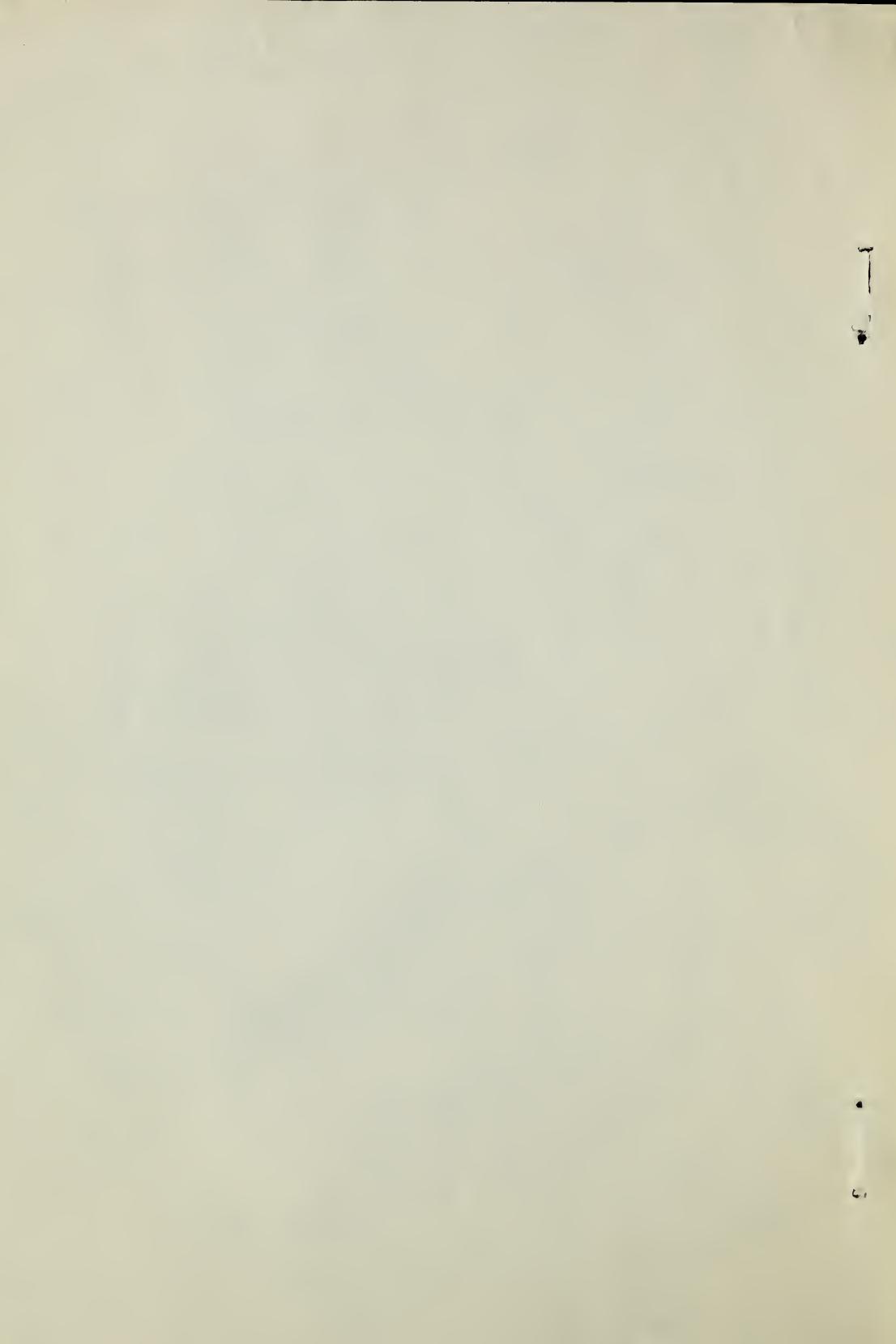
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SCIENTIFIC METHODS
OF PREPARING
OFFICIAL COTTON STANDARDS



In Patio of
Administration Building
United States Department of Agriculture
Washington, D. C.
May 10 to 18, 1940



UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service

Exhibit for the
Eighth American Scientific Congress

to demonstrate

the scientific methods used in the U. S. Department of Agriculture in the preparation of standards and in studies of quality for cotton, a typical agricultural product of the United States.

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Standards for grades and staple lengths of cotton, prepared by the U. S. Department of Agriculture, provide the uniform measuring sticks needed in buying and selling American cotton in any part of the United States or in any other country trading in this commodity. After approval by representatives of cotton exchanges from all over the world, who meet once every 3 years in Washington, D. C., the Department's standards for grades of upland cotton become the official universal standards. Upland cotton constitutes 99.8 percent of the entire cotton crop of this country. The staple length standards are universally used, but are not official.

Two master, or reserve, sets of the universal standards for grades of American upland cotton are kept under lock and key - one in the vaults of the U. S. Treasury Department, the other in the U. S. Department of Agriculture. Duplicate copies of these standards are prepared for distribution all over the world, to cotton exchanges, mills, and other concerns trading in cotton.

Extensive research in the Department laboratories and observations on the performance of cotton of various grades and staple lengths under commercial manufacturing conditions preceded the adoption of the standards for grades and staple lengths.

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Cotton bales, purchased for use in making standards, are stored in a fireproof warehouse in Washington.

Photograph No. 1 illustrates the drawing of a sample from one of several hundred bales stored in the cotton warehouse. These bales represent every standard gradation of lint quality and staple length. They provide all of the types needed to prepare exact duplicates or "copies" of the U. S. standards for grades and staple lengths of American cotton.

From the warehouse a porter delivers the cotton to the classing room which is on the top floor of the same building. Here the classers work under controlled temperature and humidity to assure proper "condition" of the lint at the time it is classed. A special north skylight and walls of neutral gray provide the quality of light desired for accurate classing.

Photograph No. 2 shows a classer swinging into action. It is no easy task to select a lint sample with just the correct "face" or surface that is needed for the grade standard of which it is to be a copy. If the sample is not just what the classer wants, he will work it over to bring about the desired smoothness. In classing commercial cotton the classer has a range of quality in determining any one grade. In preparing copies of the official cotton standards he has no range. His sample must be made to match in every detail the sample he is copying.

Trained hands follow the course of trained eyes to add or to remove excess leaf or tangled fibers. Each sample used in the preparation of cotton standards may guide the classing of many thousands of American bales both in this country and at foreign mills and markets. Each one must be accurate in even the minute details.

Photograph No. 3 illustrates a preliminary check. This classer is shaping up his samples to match the master box of the grade standards which is next to the box on which he is working. Completed boxes of the copies, stacked in the background, await shipment to domestic and foreign mills and markets.

No classer knows where his grade boxes are to go. The boxes on which these classers are working may find their way to Milan, to Tokyo, or to Bremen. They are used by classers and mills in all countries trading in American cotton to guide their classing and trading.

Cotton standards aren't just made. Back of the standards and the classers are the research workers. They study fiber qualities upon which the spinning value and use of each grade and staple length depend.

Photograph No. 4 illustrates the method used in studying the color of cotton in a grade box. A specially constructed precision instrument is used. Color of cotton helps set the price for any bale or lot. Color measurement is an aid in the preparation of the cotton standards for grade.

Color measurements also are used in the Department's studies of damage caused by exposure in the field, deterioration in storage, and the ravages of micro-organisms which attack cotton fibers.

Photograph No. 5. On scales that are sensitive down to a 30-thousandth of an ounce, laboratory workers weigh tiny "pinches" of cotton. The length of the fibers is measured and the weight of an inch of a single fiber computed. These figures run down to a few hundredths of a millionth of an ounce.

Other weighings are made on a balance scale, a portion of each sample being used in a breaking test to determine the strength of the fibers. Strength of fibers affects the strength of the yarns and fabric that can be made from them.

Photograph No. 6 shows a laboratory worker wrapping a tiny sample of cotton fibers into a "bundle." The "bundle" is broken on a precision instrument which will measure the exact amount of tension required to rupture the fibers.

Photograph No. 7. Plenty of fine details in fine cotton. With around 90 million fibers to the pound they must be small. The workers in this photograph are inspecting cross sections of fibers. The cross sections are studied in relation to maturity, fineness, and other character and spinning properties. The pictures in the background show cross sections of fibers - enlarged many thousand times.

Photograph No. 8 illustrates the checking of cotton quality with a stop-watch. Each of the tubes contains a solution of pulverized cotton in a special chemical. Deterioration of the fibers because of exposure to weather, improper conditions in the storage warehouse, or attack by micro-organisms, affects quality. Deterioration is measured by timing the speed with which the solutions flow through tiny capillary tubes at the bases of the larger cylinders.

Photograph No. 9. The X-ray is used as a tool in searching out quality or lack of quality in cotton. It goes far beyond the highest powered microscope to reveal the structure and arrangement of the minute crystals of cellulose that make up the cotton fibers. It has been found that the more nearly parallel with each other the crystals lie the greater the strength of the cotton.

Photograph No. 10. As might be expected, the microscope is a very useful tool in studying cotton quality. A laboratory worker is shown examining a microscope slide on which cotton fibers are mounted. The microscope will reveal the proportion of thin-walled or immature fibers in the sample.

The series of pictures shown is merely one example of the use of scientific methods in the laboratories of the U. S. Department of Agriculture.

